REMARKS/ARGUMENTS

Reexamination of the captioned application is respectfully requested.

A. SUMMARY OF THIS AMENDMENT

By the current amendment, Applicant basically:

1. Amends claims 1, 13 and 19 by including therein the subject matter of cancelled dependent claim 15.
2. Cancels claim 15 without prejudice or disclaimer.
3. Requests that the Examiner initial and date the PTO-1449 provided with the IDS filed on February 26, 2004 (see section B infra).
4. Respectfully traverses all prior art rejections (see Section D infra).

B. THE FEBRUARY 26, 2004 IDS

The IDS filed on November 26, 2003 has been considered and made of record. However, the IDS filed on February 26, 2004 apparently has not been considered. The Examiner is reminded that the February 26, 2004 needs to be considered and the reference thereof made of record, i.e., it is respectfully requested that the Examiner initial and date the PTO-1449 provided with the IDS filed on February 26, 2004.

C. PATENTABILITY OF THE CLAIMS

Claims 1, 7, 10, 12, 19 and 20 stand rejected under 35 USC 102(b) as being anticipated by U.S. Patent 5,272,417 to Ohmi. Claim 19 stands rejected under 35 USC 102(b) as being anticipated by U.S. Patent 6,156,629 to Tao et al. Claim 19 further stands rejected under 35 USC 102(b) as being anticipated by U.S. Patent 6,440,864 to Kropewnicki et al. Claims 1-20 stand rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 6,440,864 to Kropewnicki et al in view of U.S. Patent 5,453,157 to Jeng. All prior art rejections are respectfully traversed.

In the "Response to Arguments" section on page 6 of the final Office Action, the Examiner incorrectly alleges that Applicant's claims do not recite features of Applicant's argument (e.g., protection of an interlayer insulation film and avoiding bonding that would change the dielectric). The Examiner has obviously overlooked limitations of, e.g., independent claim 13 and dependent claims 14 and 15.

In the above regard, independent claim 13 concludes with the following phrase:

> wherein steps (2) - (4) are performed in a manner substantially to avoid bonding that would substantially change a dielectric constant of the insulating film.

Dependent claim 14 goes even further to state that steps (2) - (4) are performed in a manner substantially *to avoid at least one of Si-H bonding and H-OH bonding* with the insulating film.

Former dependent claim 15 states that steps (2) - (4) result in formation of a *protective film on a surface of the insulating film*. The limitations of (now cancelled) dependent claim 15 have been incorporated into each of independent claims 1, 13, and 19.

It is respectfully requested that the independent claims now be properly considered, keeping in mind that the features sought by the Examiner are, in fact, included in these claims.

U.S. Patent 5,272,417 to Ohmi

Previously Applicant has argued that Ohmi does not teach or suggest a change rate of the dielectric constant of the insulating film before and after ashing is 10 % or less. The Examiner essentially acknowledges that Ohmi does not disclose this 10 % or less

confinement of dielectric change, but argues that Ohmi's has the same treatment and therefore that Ohmi's method is expected to provide the same results. Applicant respectfully continues to disagree.

Ohmi's treatment differs in a way which indicates that Ohmi does *not* achieve the 10 % or less confinement of dielectric change. U.S. Patent 5,272,417 to Ohmi does relate to RIE (reactive ion etching) for etching a semiconductor layer or an insulating layer and a metal layer provided under a resist mask. But the gist of Ohmi's disclosure is that the frequency of an RF electric power supplied to a susceptor electrode is made higher than the frequency of an RF electric power supplied to an upper electrode so that variations in ion energy are suppressed and thereby ions having an optimum energy value can be applied. Consequently, Ohmi can perform etching without damaging the substrate.

On the other hand, Applicant's independent claim 1 is directed to an ashing method for ashing a resist mask formed on a low dielectric constant film without increasing the dielectric constant of the low dielectric constant film after the low dielectric constant film is etched through the resist mask. Therefore, the present invention and Ohmi relate to different semiconductor manufacturing steps.

More particularly, the present invention and Ohmi are different in objects, constitutions and effects as described (for example) in paragraphs (i) through (iv) below.

(i) In Ohmi, when the frequency of the RF power supplied to the susceptor electrode is low (13.56 MHz). As a result, an inclined plot is obtained, which shows a wide distribution of ion energy as shown in 14 the MHz line of Fig. 3A. In Ohmi, therefore, a large number of ions have an energy higher than the average energy level. Accordingly, the object of Ohmi's disclosure is to alleviate the problems such as (1) the resist being etched, and (2) a substrate under the thin film being damaged by over-etching

of the thin film formed on the substrate and by application of high-energy ions onto the substrate.

An object of Applicant's independent claim 1, on the other hand, is to reduce the change (increase) in dielectric constant of the low dielectric constant film provided under the resist mask to be removed by ashing. As described above, the objects of the two disclosures are completely different.

(ii) The feature of Ohmi's disclosure is that the frequency of the RE power supplied to the susceptor electrode is smaller than the frequency of the RE power supplied to the upper electrode. This feature allows the inclination of I-V characteristics to be smaller as shown in 100 MHz line of Fig. 3A. As a result of this, a smaller distribution of ion energy is obtained, allowing Ohmi's object to be achieved.

One feature of the Applicant's independent claim 1 is that gas containing oxygen atoms which is introduced into a chamber is activated and that the ashing of the resist mask is performed by supplying an RE electric power to the substrate.

(iii) In Applicant's disclosure, oxygen ions are drawn to the substrate by application of RF electric power to the substrate, whereby a protective film (e.g., an SiO film as a native oxide film) is formed on the surface of the low dielectric constant film. Since this (e.g., SiO_2) film serves as a protective film, damage to the interlayer insulation film is prevented and the dielectric constant of the low dielectric constant film does not change (i.e., does not increase). In this regard, *see* page 10. lines 17-22 of the specification. Ohmi uses chlorine type gas, fluorine type gas or a mixture of these gases depending on the material to be etched by the RIE. Ohmi also uses Ar and He as a carrier gas, and H_2 and 0_2 as an additional gas. *Ohmi's gases can not form a protective film, and therefore, Ohmi can not achieve the effect of minimizing the change (increase) in dielectric constant of the low dielectric film described, e.g., in independent claim 1*.

(iv) According to the ashing method of Applicant's claims, various ones of the following effects are further achieved:

In the conventional ashing apparatus (shown in Fig. 5 of the present application) since the RF electric power can not be applied independently to the lower electrode, the ion energy necessary for suppressing the increase in dielectric constant can not be controlled. To perform ashing without supplying the RF electric power to the lower electrode, the chamber needs to have a low-pressure atmosphere so that the etching ions have a long mean free path and the ion energy is increased. However, when the chamber atmosphere has a low pressure, the protective film is not formed on the surface of the low dielectric film, and thus the increase in dielectric constant of the low dielectric film can not be suppressed. Further, since the conventional ashing apparatus needs to be provided with an exhaust pump to lower the pressure of chamber atmosphere, the cost of the apparatus is increased.

The above-mentioned problems arise when the RE electric power is not supplied to the lower electrode. However, when the RF electric power is supplied to the lower electrode as in Applicant's disclosure, ions can effectively have the energy required for the ashing, whereby the ashing can be performed without increasing the dielectric constant.

U.S. Patent 6,440,864 to Kropewnicki and Other References

U.S. Patent 6,440,864 (Kropewnicki) does not describe Applicant's step in which the a protective film (e.g., SiO_2 film) is formed on the surface of the low dielectric film (see the limitation of cancelled claim 15, which now has been incorporated into independent claims 1, 13, and 19). The Examiner alleges that Kropewnicki forms the protective layer. However, Kropewnicki has no description in this regard.

Applicant, by forming the protective film, has the effect described in the above-mentioned item (iii). This step and effect are not described or suggested in U.S. Patent 5,453,157 (Jeng) or U.S. Patent 6,156,629 (Tao et al.).

In view of the foregoing and other considerations, the Examiner has ample bases for withdrawing all rejections and for allowance of all pending claims. Accordingly, a formal indication of allowance is earnestly solicited.

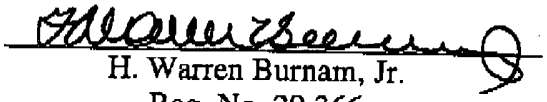
D. MISCELLANEOUS

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 
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